

## VERIFICATIONS.

*Indications.*—The detailed comparison of the tri-daily indications for December, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 84.9 per cent. The percentages for the four elements are: Weather, 91.0; Direction of the Wind, 83.3; Temperature, 83.4; Barometer, 81.0 per cent. By geographical districts they are: for New England, 86.6; Middle States, 88.7; South Atlantic States, 87.4; Eastern Gulf States, 86.3; Western Gulf States, 82.9; Lower Lake region, 86.5; Upper Lake region, 83.2; Tennessee and the Ohio valley, 84.8; Upper Mississippi valley, 80.3; Lower Missouri valley, 80.4; Northern Pacific coast region, 87.0; Central Pacific coast region, 90.7; Southern Pacific coast region, 92.0. There were 101 omissions to predict out of 3,813 or 2.65 per cent. Of the 3,712 predictions that have been made, 117, or 3.15 per cent. are considered to have entirely failed; 116, or 3.12 per cent. were one-fourth verified; 495, or 13.34 per cent. were one-half verified; 441, or 11.88 per cent. were three-fourths verified; 2,543, or 68.51 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

*Cautionary Signals.*—215 Cautionary Signals were displayed during the month, of which 182, or 84.7 per cent., were justified by winds of 25 miles per hour or over at, or within a radius of, 100 miles of the station. 103 Off-shore Signals were displayed, of which 94 or 91.3 per cent. were fully justified, 96 or 93.2 per cent. justified as to direction and 95 or 92.2 per cent. were justified as to velocity. Sixty-three of the Off-Shore were changed from Cautionary. 318 Signals of both kinds were displayed, of which 276 or 86.8 per cent. were fully justified. The above does not include signals ordered for 49 display stations, where the velocity is only estimated. Thirty-five signals were ordered late.

## NAVIGATION.

*Stage of Water in Rivers.*—In the table on the right-hand side of chart No. III are given the highest and lowest stages of water, as observed on the Signal Service river-gauges, during the month of December, 1880. The Arkansas, Missouri, Mississippi, lower Ohio, Red and Cumberland rivers were at a fair stage of water during the entire month. In the upper Ohio the river fell from the 6th, and on the 29th was at its lowest stage, one foot ten inches above bench-mark at Pittsburgh. In California the Sacramento rose rapidly on the 20th, but no flood occurred.

*Ice in Rivers and Harbors.*—The following items show the condition of the navigable waters throughout the United States, during the month of December, 1880, in respect to the formation of ice. In general, the upper portions of the Missouri and Mississippi rivers and tributaries, and lakes Superior, Michigan and Huron continued frozen and navigation suspended throughout month; on lakes Erie and Ontario navigation was entirely closed by the 10th, and towards the end of the month the Arkansas and Ohio rivers froze over and ice formed generally along the Atlantic and Gulf coasts. During the first half of the month considerable ice formed in the Frazer and Columbia rivers, which is noted more in detail below. *Missouri River.*—At Fort Benton ice was observed in the river on November 16th, and during the night of the 22d the river closed. During the whole of December this river remained closed by ice, from Omaha upward. At Leavenworth floating ice was reported from the 1st to 5th; on the 6th it gorged and the river remained frozen over to end of month, when the ice was thirteen inches thick. *Kansas River.*—Lawrence, Kans., 31st, ice on river 14 inches thick. *Mississippi River.*—From Davenport, Iowa, northward, this river continued frozen throughout the month. Keokuk, Iowa, 1st to 7th, floating ice; 8th, river closed; 11th, breaking up in places; 12th to 31st, open in places. St. Louis, Mo., 8th to 12th and 28th to 31st, navigation suspended by ice in river; 30th, river gorged; 31st, persons crossing river on ice. Cairo, Ill., 27th, river frozen; 30th, people crossing on ice. Memphis, Tenn., 30th and 31st, floating ice. *Des Moines River.*—Boonsboro, Iowa, 31st, ice on river 16 to 18 inches thick. *Grand or Neosho River.*—Fort Gibson, Ind. T., 28th, river frozen over; 29th, ice 5 inches thick. *Arkansas River.*—Little Rock, Ark., 29th, floating ice; 30th, river frozen entirely across, from this place up to Fort Smith, and gorged at Pine Bluff. *Red River.*—Shreveport, La., floating ice on the 29th and 31st. *Ohio River.*—Pittsburgh, Pa., 29th, river frozen, navigation closed. Wellsburg, W. Va., 1st., ice broke; 3rd, navigation resumed; 29th, river closed by ice; 31st, teams and people crossing. Portsmouth, Ohio, 21st to 29th, floating ice; 29th, during night, frozen over; 30th, people crossing. Cincinnati, Ohio, 25th, ice forming; 29th, river frozen over, navigation suspended. Vevay, Ind., 27th, navigation suspended; 31st river frozen over and people crossing. Louisville, Ky., 28th, navigation closed; canal completely and river partly frozen; 29th, river frozen over. Cairo, Ill., 29th, navigation suspended by floating ice. *Monongahela River.*—Morgantown, W. Va., 10th, river frozen; 14th, ice broke up; 28th, frozen over. *Lake Superior.*—Duluth, Minn., 4th, ice disappeared from lake; 6th, ice formed and navigation closed. Marquette, Mich., 5th, ice moved from around the docks but formed again on the 10th. *Lake Michigan.*—Chicago, lake generally frozen throughout the month; the ice moved away, temporarily, from the docks on the 5th and 14th. *Lake Huron.*—Alpena, Mich., 12th, Thunder Bay full of ice, 3 to 5 inches thick. Port Huron, Mich., 10th, navigation closed; 11th, ice 9 inches thick; 22nd, ice bridge across bay from Port Edwards to Fort Gratiot Lighthouse.